September 10, 2001

Mr. Fred Cline
Eli Lilly and Company
Lilly Corporate Center
Indianapolis, IN 46285

Re: Minor Source Modification No: 097-12605-00072
Source No.: 097-00072

Dear Mr. Cline:

On August 11, 2000, Eli Lilly and Co. submitted an Interim Minor Source Modification Petition to the ERMD requesting to add new and modify existing equipment in the B130 complex at the Lilly Technology Center (LTC). The Interim Minor Source Modification Approval 097-12605i-00012 was issued on August 31, 2000.

ERMD approves the final Minor Source Modification 097-12605-00072 that supersedes the Interim Minor Soure Modification and serves as the first construction and operation permit for the Complex B130.

For the list of existing, modified and new equipment included in this permit, please see Appendix A to the Minor Source Modification (four pages).

This Minor Source Modification approval will be incorporated into the pending Part 70 permit application pursuant to 326 IAC 2-7-10.5(l)(3). The source may begin operation of the permitted equipment upon issuance of this Minor Source Modification.

This decision is subject to the Indiana Administrative Orders and Procedures Act - IC 4-21.5-3-5. If you have any questions please call Mr. Boris Gorlin at (317) 327-2280.

Sincerely,

Vaneeta M. Kumar
Administrator, ERMD

Attachments

cc: File
Compliance - Matt Mosier
IDEM - Mindy Hahn

PART 70 MINOR SOURCE MODIFICATION
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
AND
INDIANAPOLIS ENVIRONMENTAL RESOURCES MANAGEMENT DIVISION

Eli Lilly and Company

1555 South Harding Street
Indianapolis, IN 46221

(herein known as the Permittee) is hereby authorized to construct and operate subject to the conditions contained herein, the emission units described in Section A (Source Summary) of this approval.

This approval is issued in accordance with 326 IAC 2 and 40 CFR Part 70 Appendix A and contains the conditions and provisions specified in 326 IAC 2-7 as required by 42 U.S.C. 7401, et. seq. (Clean Air Act as amended by the 1990 Clean Air Act Amendments), 40 CFR Part 70.6, IC 13-15 and IC 13-17.

Source Modification No.: 097-12605-00072	
Issued by: Vaneeta M. Kumar Administrator ERMD	Issuance Date:

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SECTION A SOURCE SUMMARY

This approval is based on information requested by the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) and Indianapolis Environmental Resources Management Division (ERMD). The information describing the emission units contained in conditions A.1 through A.2 is descriptive information and does not constitute enforceable conditions. However, the Permittee should be aware that a physical change or a change in the method of operation that may render this descriptive information obsolete or inaccurate may trigger requirements for the Permittee to obtain additional permits or seek modification of this approval pursuant to 326 IAC 2, or change other applicable requirements presented in the permit application.

A.1 General Information [326 IAC 2-7-4(c)] [326 IAC 2-7-5(15)] [326 IAC 2-7-1(22)]

The Permittee owns and operates a pharmaceuticals production and research facility.

Responsible Official:	Fred Cline, Manager of Biochemical Manufacturing
Source Address:	1555 South Harding Street, Indianapolis, IN 46221
Mailing Address:	Lilly Corporate Center, Indianapolis, IN 46285
Phone Number:	(317) 277-6517
SIC Code:	2834
County Location:	Marion
County Status:	Attainment for all criteria pollutants
Source Status:	Part 70 Permit Program. PSD major source

A.2 Emission Units and Pollution Control Equipment Summary [326 IAC 2-7-4(c)(3)] [326 IAC 2-7-5(15)]

This stationary source is approved to construct and operate new equipment and modification of existing equipment in the B130 complex (batch operations - pharmaceuticals production). One group of equipment will be utilized solely for the production of KPB (insulin analog), another will consist of storage tanks which supply or support the production of KPB and other existing products in the B130 complex (i.e., r-Glucagon). For the full list of existing and new equipment - see Appendix A (five pages).

A.3 Part 70 Permit Applicability [326 IAC 2-7-2]

This stationary source is required to have a Part 70 permit by 326 IAC 2-7-2 (Applicability) because:

(a) It is a major source, as defined in 326 IAC 2-7-1(22).

SECTION B GENERAL CONSTRUCTION CONDITIONS

B.1 Definitions [326 IAC 2-7-1]

Terms in this approval shall have the definition assigned to such terms in the referenced regulation. In the absence of definitions in the referenced regulation, any applicable definitions found in IC 13-11, 326 IAC 1-2 and 326 IAC 2-7 shall prevail.

B.2 Effective Date of the Permit [IC13-15-5-3]

Pursuant to IC 13-15-5-3, this approval becomes effective upon its issuance.

B.3 Revocation of Permits [326 IAC 2-1.1-9(5)][326 IAC 2-7-10.5(i)]

Pursuant to 326 IAC 2-1.1-9(5)(Revocation of Permits), the IDEM Commissioner and ERMD Administrator may revoke this approval if construction is not commenced within eighteen (18) months after receipt of this approval or if construction is suspended for a continuous period of one (1) year or more.

B.4 Duty to Supplement and Provide Information [326 IAC 2-7-4(b)] [326 IAC 2-7-5(6)(E)] [326 IAC 2-7-6(6)]

(a) The Permittee, upon becoming aware that any relevant facts were omitted or incorrect information was submitted in the permit application, shall promptly submit such supplementary facts or corrected information to:

Indiana Department of Environmental Management
Permits Branch, Office of Air Quality
100 North Senate Avenue, P. O. Box 6015
Indianapolis, Indiana 46206-6015

and

ERMD
2700 South Belmont Avenue
Indianapolis, IN 46221

The submittal by the Permittee does require the certification by the “responsible official” as defined by 326 IAC 2-7-1(34).

(b) The Permittee shall furnish to IDEM, OAQ, and ERMD within a reasonable time, any information that IDEM, OAQ, and ERMD may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The submittal by the Permittee does require the certification by the “responsible official” as defined by 326 IAC 2-7-1(34). Upon request, the Permittee shall also furnish to IDEM, OAQ, and ERMD copies of records required to be kept by this permit or, for information claimed to be confidential, the Permittee may furnish such records directly to the U. S. EPA along with a claim of confidentiality. [326 IAC 2-7-5(6)(E)]

(c) The Permittee may include a claim of confidentiality in accordance with 326 IAC 17. When furnishing copies of requested records directly to U. S. EPA, the Permittee may assert a claim of confidentiality in accordance with 40 CFR 2, Subpart B.

SECTION C GENERAL OPERATION CONDITIONS

C.1 Certification [326 IAC 2-7-4(f)][326 IAC 2-7-6(1)][326 IAC 2-7-5(3)(C)]

(a) Where specifically designated by this approval or required by an applicable requirement, any application form, report, or compliance certification submitted under this approval shall contain certification by a responsible official of truth, accuracy, and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

(b) A responsible official is defined at 326 IAC 2-7-1(34).

C.2 Permit Amendment or Modification [326 IAC 2-7-11] [326 IAC 2-7-12]

(a) The Permittee must comply with the requirements of 326 IAC 2-7-11 or 326 IAC 2-7-12 whenever the Permittee seeks to amend or modify this approval.

(b) Any application requesting an amendment or modification of this approval shall be submitted to:

Indiana Department of Environmental Management
Permits Branch, Office of Air Quality
100 North Senate Avenue, P.O. Box 6015
Indianapolis, Indiana 46206-6015

and

ERMD
2700 South Belmont Avenue
Indianapolis, IN 46221.

Any such application should be certified by the "responsible official" as defined by 326 IAC 2-7-1(34) only if a certification is required by the terms of the applicable rule

(c) The Permittee may implement administrative amendment changes addressed in the request for an administrative amendment immediately upon submittal of the request. [326 IAC 2-7-10.5].

C.3 Opacity [326 IAC 5-1]

Pursuant to 326 IAC 5-1-2 (Opacity Limitations), except as provided in 326 IAC 5-1-3 (Temporary Exemptions), visible emissions shall meet the following, unless otherwise stated in this approval:

(a) Opacity shall not exceed an average of thirty percent (30%) in any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of fifteen (15) minutes (sixty (60) readings) as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor in a six (6) hour period.

SECTION D.1 FACILITY OPERATION CONDITIONS

Facility Description [326 IAC 2-7-5(15)]: New equipment and modification of existing equipment in the B130 complex (batch operations - pharmaceuticals production). One group of equipment will be utilized solely for the production of KPB (insulin analog), another will consist of storage tanks which supply or support the production of KPB and other existing products in the B130 complex (i.e., r-Glucagon). For the full list of existing and new equipment - see Appendix A (four pages).

(The information describing the process contained in this facility description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.1.1 Particulate Matter (PM) [326 IAC 6-3-2 (Process Operations: Particulate Emission Limitation)] [326IAC 2-2 (Prevention of Significant Deterioration)]

(a) Pursuant to 326 IAC 6-3-2 (Process Operations), particulate matter emission from the urea prill unloading process (Emission Unit ID # TK-265) is subject to this rule. The PM hourly emission from Emission Unit ID #TK-265 shall not exceed 27.0 pounds per hour based on a maximum throughput of 16.7 tons per hour. The scrubber for Emission Unit ID # TK-265 is an integral part of the urea prill unloading process.

(b) The PM emissions from the complex B130 shall be limited to less than 100 tons per year, such that 326 IAC 2-2 requirements do not apply.

Indiana Department of Environmental Management
Office of Air Management
and
Indianapolis Environmental Resources Management Division

Technical Support Document (TSD) for a Part 70 Minor Source Modification

Source Background and Description

Source Name: Eli Lilly and Company
Source Location: 1555 South Harding Street, Indianapolis, IN 46285
County: Marion
SIC Code: 2834
Source Modification No.: 097-12605-00072
Part 70 Permit No.: 097-6846-00072
Permit Reviewer: Boris Gorlin

The Environmental Resources Management Division (ERMD) has reviewed an application from Eli Lilly and Co. for a Minor Source Modification relating to the installation of new equipment and modification of existing equipment in the B130 complex (batch operations - pharmaceuticals production). One group of equipment will be utilized solely for the production of KPB (insulin analog), another will consist of storage tanks which supply or support the production of KPB and other existing products in the B130 complex (i.e., r-Glucagon). The following existing equipment will be modified and new equipment installed:

EU ID #	Stack ID #	New/Existing	Description	Capacity
CENT-1121	CENT-1121	New	Centrifuge	NA
Col-101	Col-101	Existing	Column	140 cm
Col-102	Col-102	Existing	Column	140 cm
Col-262C	Col-262C	Existing	Column	35 cm
Col-262D	Col-262D	Existing	Column	35 cm
Col-262E	Col-262E	Existing	Column	35 cm
Col-262F	Col-262F	New	Column	NA
Col-262G	Col-262G	New	Column	NA
Col-262H	Col-262H	New	Column	NA
Col-3260	Col-3260	New	Column	59 cm
Col-3270	Col-3270	New	Column	59 cm
Col-343	Col-343	Existing	Column	100 cm
Col-344	Col-344	Existing	Column	100 cm
Col-3520	Col-3520	Existing	Column	200 CM
Col-3530	Col-3530	Existing	Column	200 CM
Col-3780	Col-3780	New	Column	140 cm
Col-384	Col-384	Existing	Column	140 cm
Col-385	Col-385	Existing	Column	140 cm
Col-3860	Col-3860	New	Column	NA
Col-3865	Col-3865	New	Column	NA
FLT-004	FLT-004	Existing	Filter	400 FT2

FLT-240	FLT-240	Existing	Filter	1200 FT2
FLT-280	FLT-280	Existing	Filter	1600 FT2
FLT-3090	FLT-3090	New	UltraFilter	1200 FT2
FLT-3340	FLT-3340	New	UltraFilter	300 FT2
FLT-3391	FLT-3391	New	Buchner Filter	50 L
FLT-3395	FLT-3395	New	Buchner Filter	50 L
FLT-3890	FLT-3890	New	Buchner Filter	50 L
GW-3670	GW-3670	New	Girton Washer	NA
TFT508	TFT508	Existing	Storage/Mis Tk	75,700 L
TFT-512	TFT-512	Existing	Tank	20,000 gal
TFT-512A	TFT-512A	New	Tank	28,681 gal
TFT513	TFT513	Existing	Storage/Mis Tk	37,850 L
TK-004	TK-004	Existing	Tank	2,000 L
TK-122	TK-122	Existing	Buffer Tank	1,500 L
TK-128	TK-128	Existing	Buffer Tank	700 L
TK-132	TK-132	Existing	Buffer Tank	600 L
TK-19	TK-19	Existing	Buffer Tank	10,000 L
TK-191	TK-191	Existing	Buffer Tank	500 L
TK-20	TK-20	Existing	Buffer Tank	10,000 L
TK-201	TK-201	Existing	Buffer Tank	12,500 L
TK-202	TK-202	Existing	Tank	12,500 L
TK-203	TK-203	Existing	Tank	12,500 L
TK-206	TK-206	Existing	Buffer Tank	2,000 L
TK-207	TK-207	Existing	Buffer Tank	5,000 L
TK-208	TK-208	Existing	Buffer Tank	5,000 L
TK-210	TK-210	Existing	Buffer Tank	5,000 L
TK-211	TK-211	Existing	Tank	7,200 L
TK-213	TK-213	Existing	Buffer Tank	2,000 L
TK-214	TK-214	Existing	Buffer Tank	2,000 L
TK-216	TK-216	Existing	Buffer Tank	2,000 L
TK-217	TK-217	Existing	Buffer Tank	2,000 L
TK-222	TK-222	Existing	Tank	2,000 L
TK-223	TK-223	New	Tank	2,000 L
TK-2231	TK-2231	Existing	Buffer Tank	5,000 L
TK-2232	TK-2232	Existing	Storage Tank	1,500 L
TK-224	TK-224	Existing	Buffer Tank	2,100 L
TK-2251	TK-2251	New	Tank	3,500 L
TK-2312	TK-2312	Existing	Buffer Tank	5,000 L
TK-2341	TK-2341	Existing	Tank	4,600 L
TK-2342	TK-2342	New	Tank	1,000 L
TK-239	TK-239	Existing	Tank	2,000 L
TK-240	TK-240	Existing	Tank	2,000 L
TK-260	TK-260	Existing	Buffer Tank	2,100 L
TK-2601	TK-2601	New	Tank	2,500 L
TK-261	TK-261	Existing	Buffer Tank	1,200 L
TK-265	TK-265	Existing	Tank & Scrubber	15,000 gal
TK-267	TK-267	Existing	Buffer Tank	1,300 L
TK-273	TK-273	Existing	Buffer Tank	16,000 L
TK-274	TK-274	New	Tank	6,000 L
TK-275	TK-275	Existing	Tank	4,000 L
TK-276A	TK-276A	Existing	Buffer Tank	5,700 L
TK-276B	TK-276B	Existing	Buffer Tank	6,000 L
TK-280	TK-280	Existing	Tank	1000 L
TK-282	TK-282	Existing	Buffer Tank	750 L
TK-283	TK-283	Existing	Tank	2,100 L

TK-2831	TK-2831	New	Tank	2,500 L
TK-283A	TK-283A	Existing	Tank	4,000 L
TK-284	TK-284	Existing	Buffer Tank	5,700 L
TK-285	TK-285	Existing	Buffer Tank	3,000 L
TK-286	TK-286	Existing	Buffer Tank	3,000 L
TK-288	TK-288	Existing	Buffer Tank	5,700 L
TK-290	TK-290	Existing	Tank	4,000 L
TK-291	TK-291	Existing	Buffer Tank	4,000 L
TK-293	TK-293	Existing	Buffer Tank	4,000 L
TK-294	TK-294	Existing	Buffer Tank	4,000 L
TK-296	TK-296	Existing	Tank	13,000 L
TK-298	TK-298	Existing	Tank	13,000 L
TK-299	TK-299	Existing	Tank	13,000 L
TK-3010	TK-3010	New	Tank	2,000 L
TK-3120	TK-3120	New	Tank	1,500 L
TK-3140	TK-3140	New	Tank	2,500L
TK-3200	TK-3200	New	Tank	660 L
TK-3202	TK-3202	New	Tank	660 L
TK-3205	TK-3205	New	Tank	660 L
TK-3240	TK-3240	New	Tank	4,000 L
TK-3250	TK-3250	New	Tank	2,200 L
TK-3260	TK-3260	New	Tank	500 L
TK-3270	TK-3270	New	Tank	500 L
TK-3280	TK-3280	New	Tank	660 L
TK-3285	TK-3285	New	Tank	660 L
TK-3290	TK-3290	New	Tank	660 L
TK-3295	TK-3295	New	Tank	660 L
TK-3300	TK-3300	New	Tank	380 L
TK-3305	TK-3305	New	Tank	380 L
TK-3310	TK-3310	New	Tank	3,000 L
TK-3320	TK-3320	New	Tank	3000 L
TK-3325	TK-3325	New	Tank	3000 L
TK-3330	TK-3330	New	Tank	500 L
TK-3340	TK-3340	New	Tank	120 L
TK-335	TK-335	Existing	Buffer Tank	1,000 L
TK-3350	TK-3350	New	Tank	250 L
TK-3370	TK-3370	New	Tank	2,200 L
TK-3380	TK-3380	New	Tank	5,700 L
TK-3390	TK-3390	Existing	Tank	5,300 L
TK-3391	TK-3391	New	Tank	57 L
TK-3420	TK-3420	Existing	Buffer Tank	6,000 L
TK-3470	TK-3470	Existing	Buffer Tank	4,000 L
TK-3510	TK-3510	New	Buffer Tank	80 L
TK-3520	TK-3520	Existing	Tank	300 L
TK-3521	TK-3521	New	Buffer Tank	80 L
TK-3525	TK-3525	New	Buffer Tank	380 L
TK-3530	TK-3530	Existing	Tank	300 L
TK-3531	TK-3531	Existing	Tank	4,000 L
TK-3570	TK-3570	Existing	Buffer Tank	3,000 L
TK-3580	TK-3580	New	Buffer Tank	660 L
TK-3610	TK-3610	Existing	Buffer Tank	12,500 L
TK-3650	TK-3650	New	Tank	450 L
TK-3680	TK-3680	New	Tank	2,000 L
TK-3700	TK-3700	New	Buffer Tank	2,200 L
TK-3720	TK-3720	New	Tank	2,200 L
TK-3730	TK-3730	New	Tank	13,000 L

TK-3740	TK-3740	New	Tank	1,500 L
TK-3760	TK-3760	New	Tank	2,500 L
TK-3790	TK-3790	New	Tank	4,000 L
TK-3810	TK-3810	New	Tank	500 L
TK-3820	TK-3820	New	Tank	660 L
TK-3825	TK-3825	New	Tank	660 L
TK-3830	TK-3830	New	Tank	380 L
TK-3850	TK-3850	New	Tank	250 L
TK-3870	TK-3870	New	Tank	2,200 L
TK-3880	TK-3880	New	Tank	5,700 L
TK-3890	TK-3890	New	Tank	57 L
TK-3900	TK-3900	New	Buffer Tank	300 L
TK-3902	TK-3902	New	Buffer Tank	300 L
TK-3905	TK-3905	New	Buffer Tank	300 L
TK-3910	TK-3910	New	Tank	4,000 L
TK-3930	TK-3930	New	Tank	450 L
TK-441	TK-441	Existing	Buffer Tank	12,500 L
TK-523	TK-523	Existing	Buffer Tank	20,000 L
TK-6340	TK-6340	New	Tank	4,850 L
TK-6345	TK-6345	New	Tank	4,850 L
TK-6630	TK-6630	New	Tank	1,000 L
TK-6640	TK-6640	New	Tank	1,000 L
TK-748	TK-748	Existing	Tank	400 L
TK-750	TK-750	Existing	Buffer Tank	4,000 L
TK-753	TK-753	Existing	Buffer Tank	4,000 L
TK-754	TK-754	Existing	Buffer Tank	500 L
TK-755	TK-755	Existing	Buffer Tank	500 L
TK-756	TK-756	Existing	Buffer Tank	7,600 L
TK-757	TK-757	Existing	Buffer Tank	1,500 L
TKN-19	TKN-19	New	Buffer Tank	10,000 L
TKN-207	TKN-207	New	Buffer Tank	10,000 L
TKN-283	TKN-283	New	Buffer Tank	2,000 L
TKN-291	TKN-291	New	Buffer Tank	8,000 L
TKN-3390	TKN-3390	New	Tank	50 L
UF-6630	UF-6630	New	UltraFilter	3,500 sqft
UF-6640	UF-6640	New	UltraFilter	3,500 sqft
VD-3400	VD-3400	New	Vacuum Dryer	NA

History

On August 11, 2000, Eli Lilly and Co. submitted an Interim Minor Source Modification Petition to the ERMD requesting to add new and modify existing equipment in the B130 complex at the Lilly Technology Center (LTC). The Interim Minor Source Modification Approval 097-12605i-00012 was issued on August 31, 2000 and expires on the effective date of the final Minor Source Modification.

The source applied for a Part 70 Permit application T097-6846-00072 on October 8, 1996, for the existing source. The new equipment being reviewed under this permit shall be incorporated in the submitted Part 70 application. No previous permits were issued for this facility - B130 complex (pharmaceuticals production). A majority of the equipment is existing and has been identified as eligible for the limited liability program in the Title V Permit Application for the Lilly Technology Center (according to IC 13-13-17-7). The changes under this review include modifying the technological process and piping, and adding some new tanks.

Air Pollution Control Justification as an Integral Part of the Process

The company has submitted the following justification such that the Scrubber Emission Unit ID TK-265, controlling emissions from urea prills pneumatic unloading process into the storage tank TK-265, be considered as an integral part of the process:

(a) The Scrubber is a vital part of the process because without it the Tank's vent would be immediately clogged preventing pneumatic unloading operation;

(b) The urea prills collected in the Scrubber are recycled and used in the process.

ERMD has evaluated the justifications and agreed that the Scrubber Emission Unit ID # TK-265, will be considered as an integral part of the urea prills pneumatic unloading process. Therefore, the permitting level will be determined using the potential to emit after the Scrubber. Operating conditions in the proposed permit will specify that this Scrubber shall operate at all times during the urea prills unloading process.

Enforcement Issue

No enforcement actions are pending.

The existing equipment (process tanks and columns) was included in the Part 70 Permit application T097-6846-00072 submitted on October 8, 1996, and is eligible for the limited liability program.

Stack Summary

See Appendix B (four pages).

Recommendation

The staff recommends to the Administrator that the Minor Source Modification be approved. This recommendation is based on the following facts and conditions:

Unless otherwise stated, information used in this review was derived from the application and additional information submitted by the applicant.

An application for the purposes of this review was received on August 11, 2000, with additional information received on December 21, 2000, July 23, 2001, and August 9, 2001.

Emission Calculations

The calculations submitted by the applicant have been verified and found to be accurate and correct. These calculations are provided in Appendix A of this document (sixteen pages).

Potential To Emit of Modification

Pursuant to 326 IAC 2-1.1-1(16), Potential to Emit is defined as "the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the U. S. EPA."

Pollutant	Current PTE, ton/yr	PTE Increase from Existing Equipment Modification (debottlenecking), ton/yr	PTE Increase from New Equipment, ton/yr	Total Projected PTE Increase ton/yr	Total Future PTE (after the modification, ton/yr
PM	8.13	0	0	0	8.13
PM-10	8.13	0	0	0	8.13
SO_2	0	0	0	0	0
VOC	25.7	0.3	15.9	**16.2**	41.9
CO	0	0		0	0
NO_x	0	0		0	0

HAP	Current PTE, ton/yr	PTE Increase from Existing Equipment Modification (debottlenecking), ton/yr	PTE Increase from New Equipment, ton/yr	Total Projected PTE Increase ton/yr	Total Future PTE (after the modification, ton/yr
ACN	17.0	0.2	8.2	**8.4**	25.4

Justification for Modification

The Part 70 Operating permit application is being modified through a Part 70 Minor Source Modification pursuant to 326 IAC 2-7-10.5(d)(5) and (e), because its potential to emit all regulated pollutants is less than 25 tons per year.

County Attainment Status

The source is located in Marion County.

Pollutant	Status
PM-10	Attainment
SO_2	Maintenance
NO_2	Attainment
Ozone	Maintenance
CO	Attainment
Lead	Attainment

(a) Volatile organic compounds (VOC) and oxides of nitrogen (NOx) are precursors for the formation of ozone. Therefore, VOC and NO_X emissions are considered when evaluating the rule applicability relating to the ozone standards. Marion County has been designated as attainment or unclassifiable for ozone. Therefore, VOC and NOx emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2 and 40 CFR 52.21.

(b) Marion County has been classified as attainment or unclassifiable for all the criteria pollutants. Therefore, these emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2 and 40 CFR 52.21.

Source Status

Existing Source PSD or Emission Offset Definition (emissions after controls, based upon 8760 hours of operation per year at rated capacity and/or as otherwise limited):

Pollutant	Emissions (tons/year)
PM	<100
PM-10	<100
SO_2	<100
VOC	**>100**
CO	<100
NOx	<100

(a) According to 326 IAC 2-2-1(p)(1)(U), this existing source is one of the 28 listed source categories and is a major stationary source because an attainment regulated pollutant is emitted at a rate of 100 tons per year or more.

(c) These emissions are based upon the source's 1999 annual emission statement.

Potential to Emit After Issuance

The table below summarizes the potential to emit, reflecting all limits, of the significant emission units after controls. The control equipment is considered federally enforceable only after issuance of this Part 70 operating permit.

Complex B130	Potential to Emit (tons/year)						
Pollutants	PM	PM-10	SO_2	VOC	CO	NO_X	HAPs (ACN)
Current PTE	8.13	8.13	0	25.7	0	0	17.0
Future PTE	8.13	8.13	0	**41.9**	0	0	25.4
Past Actual Emissions, 1998 & 1999 Average				**4.4**			
Emissions Increase: Future PTE - Past Actual (VOC), Future PTE - Current PTE (HAPs)	0	0	0	**37.5**	0	0	8.3
PSD or Offset Significant Levels	25	15	40	40	100	40	10/25

This modification to an existing major stationary source is not major because the emissions increase is less than the PSD significant levels. Therefore, pursuant to 326 IAC 2-2, and 40 CFR 52.21, the PSD requirements do not apply.

Federal Rule Applicability

(a) 40 CFR Part 63, Subparts H and I, the SOCMI/HON Leak Detection and Repair Requirements, apply to pharmaceutical manufacturing that use methylene chloride or carbon tetrachloride and are in service for more than 300 hours per year. This process does not use the chemicals mentioned in the subparts H and I. Therefore, these requirements do not apply to this modification.

(b) 40 CFR 60, Subpart Kb (Standards of Performance for VOL Storage Vessels) does not apply to this modification, because no new storage tanks (being installed as part of this modification) capacity is equal or greater than 40 cubic meters, none of the existing storage tanks are being modified or reconstructed as part of this modification.

(c) There are no other New Source Performance Standards (40 CFR Part 60) applicable to this modification.

(d) The equipment in this modification will be subject to the existing source MACT standard and will be required to comply with the provisions and reporting requirements under the Pharmaceutical MACT, as specified in 40 CFR Part 63, Subpart GGG, 63.1250 (f)(1), by the compliance date established by the Subpart GGG for existing sources - October 21, 2002. Until that date (or such later compliance date that may be established by the U.S. EPA) the provisions of the MACT standard for Pharmaceuticals Production do not apply to this modification.

State Rule Applicability - Entire Source

326 IAC 2-6 (Emission Reporting)

This source is subject to 326 IAC 2-6 (Emission Reporting), because it has the potential to emit more than one hundred (100) tons per year of VOC. Pursuant to this rule, the owner/operator of the source must annually submit an emission statement for the source. The annual statement must be received by April 15 of each year and contain the minimum requirement as specified in 326 IAC 2-6-4. The submittal should cover the period defined in 326 IAC 2-6-2(8)(Emission Statement Operating Year).

326 IAC 5-1 (Visible Emissions Limitations)

Pursuant to 326 IAC 5-1-2 (Opacity Limitations), except as provided in 326 IAC 5-1-3 (Temporary Exemptions), opacity shall meet the following, unless otherwise stated in this permit:

(a) Opacity shall not exceed an average of thirty percent (30%) any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of fifteen (15) minutes (sixty (60) readings) as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor) in a six (6) hour period.

326 IAC 2-2 (Prevention of Significant Deterioration)

The PM emissions from the Complex B130 shall be limited to less than 100 ton/yr such that 326 IAC 2-2 will not apply to this modification. The B130 complex PM PTE is 8.13 ton/yr; therefore this facility will be in compliance with this limit.

326 IAC 8-5-3 (Miscellaneous operations: Synthesized Pharmaceutical Manufacturing)

This source as a pharmaceutical products manufacturing by chemical synthesis facility is subject to this rule. However, the VOC point source PTE from each individual emission unit of this modification is less than 15 pounds per day. Therefore, the control requirements of 326 IAC8-5-3 do not apply to this modification.

326 IAC 8-1-6 (New Source General Emission Reduction Requirements)

Since this source is regulated by 326 IAC 8-5-3, rule 326 IAC 8-1-6 does not apply.

326 IAC 2.4.1 (Major Sources of Hazardous Air Pollutants)

This source is a major source of HAPs and is regulated by a MACT standard issued under section 112(d) of the Clean Air Act, the provision of Section 112(g) of the of the Clean Air Act Amendments of 1990, as implemented at CFR 40 Part 63, Subpart GGG. Therefore, pursuant to 326 IAC 2-4.1-1(b)(2), this rule is not applicable to this modification.

State Rule Applicability - Individual Facilities

326 IAC 6-3-2 (Process Operations: Particulate Emission Limitation)

The storage tank TK-265 urea prills unloading operation is subject to this rule. The potential PM hourly emissions from the scrubber (integral part of the process) is 4.95 lb/hr, and the process weight limit based on the unloading rate of 16.7 tons/hr is 27.0 lb/hr. Therefore, TK-265 will comply with the 326 IAC 6-3-2 emission limit without using additional particulate matter control devices.

Conclusion

The operation of new equipment and modification of existing equipment in the B130 complex (batch operations - pharmaceuticals production) shall be subject to the conditions of the attached proposed Minor Source Modification 097-12605-00072.

Appendix A

Company Name: Eli Lilly and Company, Complex B130
Minor Source Modification: 097-12605-00072
Part 70 Permit No.: 097-6846-00072
Reviewer: Boris Gorlin

EMISSION UNIT DESCRIPTION INFORMATION

EU ID #	Stack ID #	New/Existing	Description	Capacity
CENT-1121	CENT-1121	New	Centrifuge	NA
Col-101	Col-101	Existing	Column	140 cm
Col-102	Col-102	Existing	Column	140 cm
Col-262C	Col-262C	Existing	Column	35 cm
Col-262D	Col-262D	Existing	Column	35 cm
Col-262E	Col-262E	Existing	Column	35 cm
Col-262F	Col-262F	New	Column	NA
Col-262G	Col-262G	New	Column	NA
Col-262H	Col-262H	New	Column	NA
Col-3260	Col-3260	New	Column	59 cm
Col-3270	Col-3270	New	Column	59 cm
Col-343	Col-343	Existing	Column	100 cm
Col-344	Col-344	Existing	Column	100 cm
Col-3520	Col-3520	Existing	Column	200 CM
Col-3530	Col-3530	Existing	Column	200 CM
Col-3780	Col-3780	New	Column	140 cm
Col-384	Col-384	Existing	Column	140 cm
Col-385	Col-385	Existing	Column	140 cm
Col-3860	Col-3860	New	Column	NA
Col-3865	Col-3865	New	Column	NA
FLT-004	FLT-004	Existing	Filter	400 FT2
FLT-240	FLT-240	Existing	Filter	1200 FT2
FLT-280	FLT-280	Existing	Filter	1600 FT2
FLT-3090	FLT-3090	New	UltraFilter	1200 FT2
FLT-3340	FLT-3340	New	UltraFilter	300 FT2
FLT-3391	FLT-3391	New	Buchner Filter	50 L
FLT-3395	FLT-3395	New	Buchner Filter	50 L
FLT-3890	FLT-3890	New	Buchner Filter	50 L
GW-3670	GW-3670	New	Girton Washer	NA
TFT508	TFT508	Existing	Storage/Mis Tk	75,700 L
TFT-512	TFT-512	Existing	Tank	20,000 gal
TFT-512A	TFT-512A	New	Tank	28,681 gal
TFT513	TFT513	Existing	Storage/Mis Tk	37,850 L
TK-004	TK-004	Existing	Tank	2,000 L
TK-122	TK-122	Existing	Buffer Tank	1,500 L
TK-128	TK-128	Existing	Buffer Tank	700 L
TK-132	TK-132	Existing	Buffer Tank	600 L
TK-19	TK-19	Existing	Buffer Tank	10,000 L
TK-191	TK-191	Existing	Buffer Tank	500 L
TK-20	TK-20	Existing	Buffer Tank	10,000 L
TK-201	TK-201	Existing	Buffer Tank	12,500 L
TK-202	TK-202	Existing	Tank	12,500 L
TK-203	TK-203	Existing	Tank	12,500 L
TK-206	TK-206	Existing	Buffer Tank	2,000 L

Appendix A

TK-207	TK-207	Existing	Buffer Tank	5,000 L
TK-208	TK-208	Existing	Buffer Tank	5,000 L
TK-210	TK-210	Existing	Buffer Tank	5,000 L
TK-211	TK-211	Existing	Tank	7,200 L
TK-213	TK-213	Existing	Buffer Tank	2,000 L
TK-214	TK-214	Existing	Buffer Tank	2,000 L
TK-216	TK-216	Existing	Buffer Tank	2,000 L
TK-217	TK-217	Existing	Buffer Tank	2,000 L
TK-222	TK-222	Existing	Tank	2,000 L
TK-223	TK-223	New	Tank	2,000 L
TK-2231	TK-2231	Existing	Buffer Tank	5,000 L
TK-2232	TK-2232	Existing	Storage Tank	1,500 L
TK-224	TK-224	Existing	Buffer Tank	2,100 L
TK-2251	TK-2251	New	Tank	3,500 L
TK-2312	TK-2312	Existing	Buffer Tank	5,000 L
TK-2341	TK-2341	Existing	Tank	4,600 L
TK-2342	TK-2342	New	Tank	1,000 L
TK-239	TK-239	Existing	Tank	2,000 L
TK-240	TK-240	Existing	Tank	2,000 L
TK-260	TK-260	Existing	Buffer Tank	2,100 L
TK-2601	TK-2601	New	Tank	2,500 L
TK-261	TK-261	Existing	Buffer Tank	1,200 L
TK-265	TK-265	Existing	Tank & Scrubber	15,000 gal
TK-267	TK-267	Existing	Buffer Tank	1,300 L
TK-273	TK-273	Existing	Buffer Tank	16,000 L
TK-274	TK-274	New	Tank	6,000 L
TK-275	TK-275	Existing	Tank	4,000 L
TK-276A	TK-276A	Existing	Buffer Tank	5,700 L
TK-276B	TK-276B	Existing	Buffer Tank	6,000 L
TK-280	TK-280	Existing	Tank	1000 L
TK-282	TK-282	Existing	Buffer Tank	750 L
TK-283	TK-283	Existing	Tank	2,100 L
TK-2831	TK-2831	New	Tank	2,500 L
TK-283A	TK-283A	Existing	Tank	4,000 L
TK-284	TK-284	Existing	Buffer Tank	5,700 L
TK-285	TK-285	Existing	Buffer Tank	3,000 L
TK-286	TK-286	Existing	Buffer Tank	3,000 L
TK-288	TK-288	Existing	Buffer Tank	5,700 L
TK-290	TK-290	Existing	Tank	4,000 L
TK-291	TK-291	Existing	Buffer Tank	4,000 L
TK-293	TK-293	Existing	Buffer Tank	4,000 L
TK-294	TK-294	Existing	Buffer Tank	4,000 L
TK-296	TK-296	Existing	Tank	13,000 L
TK-298	TK-298	Existing	Tank	13,000 L
TK-299	TK-299	Existing	Tank	13,000 L
TK-3010	TK-3010	New	Tank	2,000 L
TK-3120	TK-3120	New	Tank	1,500 L
TK-3140	TK-3140	New	Tank	2,500L
TK-3200	TK-3200	New	Tank	660 L
TK-3202	TK-3202	New	Tank	660 L
TK-3205	TK-3205	New	Tank	660 L
TK-3240	TK-3240	New	Tank	4,000 L
TK-3250	TK-3250	New	Tank	2,200 L
TK-3260	TK-3260	New	Tank	500 L
TK-3270	TK-3270	New	Tank	500 L
TK-3280	TK-3280	New	Tank	660 L
TK-3285	TK-3285	New	Tank	660 L

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TK-3290	TK-3290	New	Tank	660 L
TK-3295	TK-3295	New	Tank	660 L
TK-3300	TK-3300	New	Tank	380 L
TK-3305	TK-3305	New	Tank	380 L
TK-3310	TK-3310	New	Tank	3,000 L
TK-3320	TK-3320	New	Tank	3000 L
TK-3325	TK-3325	New	Tank	3000 L
TK-3330	TK-3330	New	Tank	500 L
TK-3340	TK-3340	New	Tank	120 L
TK-335	TK-335	Existing	Buffer Tank	1,000 L
TK-3350	TK-3350	New	Tank	250 L
TK-3370	TK-3370	New	Tank	2,200 L
TK-3380	TK-3380	New	Tank	5,700 L
TK-3390	TK-3390	Existing	Tank	5,300 L
TK-3391	TK-3391	New	Tank	57 L
TK-3420	TK-3420	Existing	Buffer Tank	6,000 L
TK-3470	TK-3470	Existing	Buffer Tank	4,000 L
TK-3510	TK-3510	New	Buffer Tank	80 L
TK-3520	TK-3520	Existing	Tank	300 L
TK-3521	TK-3521	New	Buffer Tank	80 L
TK-3525	TK-3525	New	Buffer Tank	380 L
TK-3530	TK-3530	Existing	Tank	300 L
TK-3531	TK-3531	Existing	Tank	4,000 L
TK-3570	TK-3570	Existing	Buffer Tank	3,000 L
TK-3580	TK-3580	New	Buffer Tank	660 L
TK-3610	TK-3610	Existing	Buffer Tank	12,500 L
TK-3650	TK-3650	New	Tank	450 L
TK-3680	TK-3680	New	Tank	2,000 L
TK-3700	TK-3700	New	Buffer Tank	2,200 L
TK-3720	TK-3720	New	Tank	2,200 L
TK-3730	TK-3730	New	Tank	13,000 L
TK-3740	TK-3740	New	Tank	1,500 L
TK-3760	TK-3760	New	Tank	2,500 L
TK-3790	TK-3790	New	Tank	4,000 L
TK-3810	TK-3810	New	Tank	500 L
TK-3820	TK-3820	New	Tank	660 L
TK-3825	TK-3825	New	Tank	660 L
TK-3830	TK-3830	New	Tank	380 L
TK-3850	TK-3850	New	Tank	250 L
TK-3870	TK-3870	New	Tank	2,200 L
TK-3880	TK-3880	New	Tank	5,700 L
TK-3890	TK-3890	New	Tank	57 L
TK-3900	TK-3900	New	Buffer Tank	300 L
TK-3902	TK-3902	New	Buffer Tank	300 L
TK-3905	TK-3905	New	Buffer Tank	300 L
TK-3910	TK-3910	New	Tank	4,000 L
TK-3930	TK-3930	New	Tank	450 L
TK-441	TK-441	Existing	Buffer Tank	12,500 L
TK-523	TK-523	Existing	Buffer Tank	20,000 L
TK-6340	TK-6340	New	Tank	4,850 L
TK-6345	TK-6345	New	Tank	4,850 L
TK-6630	TK-6630	New	Tank	1,000 L
TK-6640	TK-6640	New	Tank	1,000 L
TK-748	TK-748	Existing	Tank	400 L
TK-750	TK-750	Existing	Buffer Tank	4,000 L
TK-753	TK-753	Existing	Buffer Tank	4,000 L
TK-754	TK-754	Existing	Buffer Tank	500 L

Minor Source Modification 097-12605-00072

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TK-755	TK-755	Existing	Buffer Tank	500 L
TK-756	TK-756	Existing	Buffer Tank	7,600 L
TK-757	TK-757	Existing	Buffer Tank	1,500 L
TKN-19	TKN-19	New	Buffer Tank	10,000 L
TKN-207	TKN-207	New	Buffer Tank	10,000 L
TKN-283	TKN-283	New	Buffer Tank	2,000 L
TKN-291	TKN-291	New	Buffer Tank	8,000 L
TKN-3390	TKN-3390	New	Tank	50 L
UF-6630	UF-6630	New	UltraFilter	3,500 sqft
UF-6640	UF-6640	New	UltraFilter	3,500 sqft
VD-3400	VD-3400	New	Vacuum Dryer	NA

	Attachment B						
		Company Name:	Eli Lilly and Company, Complex B130				
		Minor Source Modification:	097-12605-00072				
	Part 70 Permit No.:		097-6485-00072				
			Reviewer: Boris Gorlin				

Stack Information

#	Stack ID #	Emission Unit ID	Control Equipment ID #	Height above ground, (feet)	For circular stacks diameter (feet inside)	Gas discharge temp. (^{O}F)	Gas flow rate (acfm)
1	Col-101	Col-101	N/A	66	0.125	40	10
2	Col-102	Col-102	N/A	66	0.125	40	10
3	Col-262C	Col-262C	N/A	66	0.125	40	10
4	Col-262D	Col-262D	N/A	66	0.125	40	10
5	Col-262E	Col-262E	N/A	66	0.125	40	10
6	Col-262F	Col-262F	N/A	66	0.125	40	10
7	Col-262G	Col-262G	N/A	66	0.125	40	10
8	Col-262H	Col-262H	N/A	66	0.125	40	10
9	Col-3260	Col-3260	N/A	66	0.125	40	10
10	Col-3270	Col-3270	N/A	66	0.125	40	10
11	Col-343	Col-343	N/A	66	0.125	40	10
12	Col-344	Col-344	N/A	66	0.125	40	10
13	Col-3520	Col-3520	N/A	66	0.125	40	10
14	Col-3530	Col-3530	N/A	66	0.125	40	10
15	Col-3780	Col-3780	N/A	66	0.125	40	10
16	Col-384	Col-384	N/A	66	0.125	40	10
17	Col-385	Col-385	N/A	66	0.125	40	10
18	Col-3860	Col-3860	N/A	66	0.125	40	10
19	Col-3865	Col-3865	N/A	66	0.125	40	10
20	FLT-004	FLT-004	N/A	66	0.125	40	10
21	FLT-240	FLT-240	N/A	66	0.125	40	10
22	FLT-280	FLT-280	N/A	66	0.125	40	10
23	FLT-3090	FLT-3090	N/A	66	0.125	40	10
24	FLT-3340	FLT-3340	N/A	N/A	N/A	40	10
25	FLT-3391	FLT-3391	N/A	66	0.125	40	10
26	FLT-3395	FLT-3395	N/A	66	0.125	40	10
27	FLT-3890	FLT-3890	N/A	66	0.125	40	10
28	TFT508	TFT508	N/A	15	0.25	40	10
29	TFT-512	TFT-512	N/A	15	0.25	40	10
30	TFT-512A	TFT-512A	N/A	15	0.25	40	10
31	TFT513	TFT513	N/A	15	0.25	40	10
32	TK-004	TK-004	N/A	66	0.17	40	10
33	TK-122	TK-122	N/A	66	0.17	40	10
34	TK-128	TK-128	N/A	66	0.125	40	10
35	TK-132	TK-132	N/A	66	0.083	40	10
36	TK-19	TK-19	N/A	66	0.17	40	10
37	TK-191	TK-191	N/A	66	0.17	40	10
38	TK-20	TK-20	N/A	66	0.17	40	10
39	TK-201	TK-201	N/A	66	0.17	40	10
40	TK-202	TK-202	N/A	66	0.17	40	10
41	TK-203	TK-203	N/A	66	0.17	40	10
42	TK-206	TK-206	N/A	66	0.17	40	10
43	TK-207	TK-207	N/A	66	0.17	40	10
44	TK-208	TK-208	N/A	66	0.17	N/A	N/A
45	TK-210	TK-210	N/A	66	0.17	40	10
46	TK-211	TK-211	N/A	66	0.17	40	10
47	TK-213	TK-213	N/A	66	0.17	40	10
48	TK-214	TK-214	N/A	66	0.17	40	10
49	TK-216	TK-216	N/A	66	0.17	40	10
50	TK-217	TK-217	N/A	66	0.125	40	10
51	TK-222	TK-222	N/A	66	0.125	40	10
52	TK-223	TK-223	N/A	66	0.125	40	10

53	TK-2231	TK-2231	N/A	66	0.17	40	10
54	TK-2232	TK-2232	N/A	66	0.17	40	10
55	TK-224	TK-224	N/A	66	0.083	40	10
56	TK-2251	TK-2251	N/A	66	0.083	40	10
57	TK-2312	TK-2312	N/A	66	0.17	40	10
58	TK-2341	TK-2341	N/A	66	0.17	40	10
59	TK-2342	TK-2342	N/A	66	0.17	40	10
60	TK-239	TK-239	N/A	66	0.17	40	10
61	TK-240	TK-240	N/A	66	0.17	40	10
62	TK-260	TK-260	N/A	66	0.17	40	10
63	TK-2601	TK-2601	N/A	66	0.17	40	10
64	TK-261	TK-261	N/A	66	0.17	40	10
65	TK-265	TK-265	N/A	66	0.125	40	10
66	TK-267	TK-267	N/A	66	0.17	40	10
67	TK-273	TK-273	N/A	66	0.17	40	10
68	TK-274	TK-274	N/A	66	0.17	40	10
69	TK-275	TK-275	N/A	66	0.17	40	10
70	TK-276A	TK-276A	N/A	66	0.17	40	10
71	TK-276B	TK-276B	N/A	66	0.17	40	10
72	TK-282	TK-282	N/A	66	0.17	Ambient	10
73	TK-280	TK-280	N/A	66	0.17	Ambient	10
74	TK-282	TK-282	N/A	66	0.17	Ambient	10
75	TK-283	TK-283	N/A	66	0.17	Ambient	10
76	TK-2831	TK-2831	N/A	66	0.17	Ambient	10
77	TK-283A	TK-283A	N/A	66	0.17	Ambient	10
78	TK-284	TK-284	N/A	66	0.17	40	10
79	TK-285	TK-285	N/A	66	0.125	40	10
80	TK-286	TK-286	N/A	66	0.083	40	10
81	TK-288	TK-288	N/A	66	0.125	40	10
82	TK-290	TK-290	N/A	66	0.125	40	10
83	TK-291	Tk-291	N/A	66	0.125	40	10
84	TK-293	TK-293	N/A	66	0.17	40	10
85	TK-294	TK-294	N/A	66	0.17	40	10
86	TK-296	TK-296	N/A	66	0.17	40	10
87	TK-298	TK-298	N/A	66	0.17	40	10
88	TK-299	TK-299	N/A	66	0.17	40	10
89	TK-3010	TK-3010	N/A	66	0.17	40	10
90	TK-3120	TK-3120	N/A	66	0.17	40	10
91	TK-3140	TK-3140	N/A	66	0.17	40	10
92	TK-3200	TK-3200	N/A	66	0.17	40	10
93	TK-3202	TK-3202	N/A	66	0.17	40	10
94	TK-3205	TK-3205	N/A	66	0.17	40	10
95	TK-3240	TK-3240	N/A	66	0.17	40	10
96	TK-3250	TK-3250	N/A	66	0.17	40	10
97	TK-3260	TK-3260	N/A	66	0.17	40	10
98	TK-3270	TK-3270	N/A	66	0.17	40	10
99	TK-3280	TK-3280	N/A	66	0.17	40	10
100	TK-3285	TK-3285	N/A	66	0.17	40	10
101	TK-3290	TK-3290	N/A	66	0.17	40	10
102	TK-3295	TK-3295	N/A	66	0.17	40	10
103	TK-3300	TK-3300	N/A	66	0.17	40	10
104	TK-3305	TK-3305	N/A	66	0.17	40	10
105	TK-3310	TK-3310	N/A	66	0.17	40	10
106	TK-3320	TK-3320	N/A	66	0.17	40	10
107	TK-3325	TK-3325	N/A	66	0.17	40	10
108	TK-3330	TK-3330	N/A	66	0.17	40	10
109	TK-3340	TK-3340	N/A	66	0.17	40	10
110	TK-335	TK-335	N/A	66	0.125	40	10
111	TK-3350	TK-3350	N/A	66	0.17	40	10
112	TK-3370	TK-3370	N/A	66	0.17	40	10
113	TK-3380	TK-3380	N/A	66	0.17	40	10
114	TK-3390	TK-3390	N/A	66	0.083	40	10
115	TK-3391	TK-3391	N/A	66	0.083	40	10
116	TK-3420	TK-3420	N/A	66	0.125	40	10
117	TK-3470	TK-3470	N/A	66	0.125	40	10

118	TK-3510	TK-3510	N/A	66	0.083	40	10
119	TK-3520	TK-3520	N/A	66	0.083	40	10
120	TK-3521	TK-3521	N/A	66	0.083	40	10
121	TK-3525	TK-3525	N/A	66	0.083	40	10
122	TK-3530	TK-3530	N/A	66	0.083	40	10
123	TK-3531	TK-3531	N/A	66	0.083	40	10
124	TK-3570	TK-3570	N/A	66	0.17	40	10
125	TK-3580	TK-3580	N/A	66	0.17	40	10
126	TK-3610	TK-3610	N/A	66	0.17	40	10
127	TK-3650	TK-3650	N/A	66	0.17	40	10
128	TK-3680	TK-3680	N/A	66	0.17	40	10
129	TK-3700	TK-3700	N/A	66	0.17	40	10
130	TK-3720	TK-3720	N/A	66	0.17	40	10
131	TK-3730	TK-3730	N/A	66	0.17	40	10
132	TK-3740	TK-3740	N/A	66	0.17	40	10
133	TK-3760	TK-3760	N/A	66	0.17	40	10
134	TK-3790	TK-3790	N/A	66	0.17	40	10
135	TK-3810	TK-3810	N/A	66	0.17	40	10
136	TK-3820	TK-3820	N/A	66	0.17	40	10
137	TK-3825	TK-3825	N/A	66	0.17	40	10
138	TK-3830	TK-3830	N/A	66	0.17	40	10
139	TK-3850	TK-3850	N/A	66	0.17	40	10
140	TK-3880	TK-3880	N/A	66	0.17	40	10
141	TK-3870	TK-3870	N/A	66	0.17	40	10
142	TK-3880	TK-3880	N/A	66	0.17	40	10
143	TK-3890	TK-3890	N/A	66	0.17	40	10
144	TK-3900	TK-3900	N/A	66	0.17	40	10
145	TK-3902	TK-3902	N/A	66	0.17	40	10
146	TK-3905	TK-3905	N/A	66	0.17	40	10
147	TK-3910	TK-3910	N/A	66	0.17	40	10
148	TK-3930	TK-3930	N/A	66	0.17	40	10
149	TK-441	TK-441	N/A	66	0.17	40	10
150	TK-523	TK-523	N/A	66	0.083	40	10
151	TK-6340	TK-6340	N/A	66	0.083	40	10
152	TK-6345	TK-6345	N/A	66	0.083	40	10
153	TK-6630	TK-6630	N/A	66	0.083	40	10
154	TK-6640	TK-6640	N/A	66	0.083	40	10
155	TK-748	TK-748	N/A	66	0.125	40	10
156	TK-750	TK-750	N/A	66	0.17	40	10
157	TK-753	TK-753	N/A	66	0.17	40	10
158	TK-754	TK-754	N/A	66	0.17	40	10
159	TK-755	TK-755	N/A	66	0.17	40	10
160	TK-756	TK-756	N/A	66	0.17	40	10
161	TK-757	TK-757	N/A	66	0.17	40	10
162	TKN-19	TKN-19	N/A	66	0.17	40	10
163	TKN-207	TKN-207	N/A	66	0.17	40	10
164	TKN-283	TKN-283	N/A	66	0.17	40	10
165	TKN-291	TKN-291	N/A	66	0.17	40	10
166	TKN-3390	TKN-3390	N/A	66	0.083	40	10
167	VD-3400	VD-3400	N/A	66	0.125	40	10

Appendix C

Company Name: Eli Lilly and Company, Complex B130
Minor Source Modification: 097-12605-00072
Part 70 Permit No.: 097-6485-00072
Reviewer: Boris Gorlin

Emissions Calculations

ELI LILLY AND COMPANY

PACMAN PROGRAM THEORY AND SAMPLE CALCULATION
CHARGING FOR IDEAL SYSTEMS - CASE 1

PROGRAM BACKGROUND AND ASSUMPTIONS

The PACMAN Program for a charging step calculates the vapor stream displaced from a vessel being charged with a liquid or solid stream. This program models the emission from a system containing a vapor phase and a miscible liquid phase. The vessel system can contain volatile, non-volatile and inert components. Volatile components appear in both the liquid and vapor phases. Non-volatile components appear only in the liquid phase, and inert components appear only in the vapor phase.

The program calculates the composition of the vapor stream leaving the vessel assuming the vapor/liquid equilibrium composition remains constant throughout the charging step. Multiple consecutive vent condensers can be used (see “PACMAN Program Theory - Vent Condenser(s)”.). A final control device, such as Regenerative Thermal Oxidizer (RTO), can also be used in the vapor line (see “PACMAN Program Theory - Final Control Device.”).

1. The program assumes that the vented vapor is in equilibrium with the liquid in the vessel after the completion of the charge step (i.e., the vessel composition is the sum of the charged liquid/solid stream plus the liquid/solid previously in the vessel).

2. The model assumes perfectly mixed, ideal liquids and vapor phases continuously in phase equilibrium.

3. The program calculations assume that the temperature and pressure of the system are uniform and do not change over time.

4. The liquid compositions are assumed to be constant during the charging step.

A mass balance check is not required for the charging step calculation since the vapor emission is limited by the volume that the charged liquid/solid displaces. The vapor emission will never exceed the mass of the liquid in the vessel.

PROGRAM STRUCTURE

The input information necessary to run the program is:

Molecular Weight of the inert (LB/LB-mole)	*28.01*
The charging step time (minutes)	*30*
Temperature in vessel (°C, °F, °K)	*21 °C*
Pressure in vessel (mmHg, in H_2O, PSIA, PSIG, kPa)	*760 mmHg*
Composition of the liquid phase in the vessel (LB, Kg, Liters)	*See below*
Composition of the charged liquid or solid (LB, Kg, Liters)	*See below*
Density (LB/ft^3) and Molecular Weight (LB/LB-mole) of components	*See below*
Antoine coefficients for the volatile liquid components (a, b, c)	*See below*
Activity coefficient of the volatile	*1 for all components*
Inert saturation factor (≤1)	*1 for all components*

	Composition		*Density*	*Molecular Weight*	*Antoine coefficients*		
	In Vessel	*Charging*	*(LB/ft^3)*	*(LB/LB-mole)*	*a*	*b*	*c*
Acetone	*3300 LB*	*3420.3*	*49.44456*	*58.08*	*16.82*	*2993*	*-35.63*
Acetonitrile	*3300 LB*		*49.051251*	*41.05*	*16.16*	*2962*	*-44.24*
Other	*200 LB*		*50.000*	*200.00*			
Toluene		*3420.3*	*54.06438*	*92.13*	*16.28*	*3251*	*-46.61*

The density, molecular weight and Antoine coefficients for the volatile, non-volatile and inert components are automatically accessed from a component data base.

The program calculations are broken down into three steps:

Step 1 - The input data is converted and the liquid and vapor compositions in the vessel are determined.

Step 2 - The mass of inert vapors being displaced from the vessel is calculated.

Step 3 - The mass of volatile components leaving the vessel is calculated.

PROGRAM THEORY AND CALCULATIONS

This section will explain the theory and calculation methods for each step in the charge program. A summary of the nomenclature used is located at the beginning of the Theory section.

For most calculations, three sets of equations are shown:

1. The first equation is written using generally accepted engineering nomenclature.
2. The second equation is written using PACMAN nomenclature, and is presented in BOLD Geneva font.
3. Following every PACMAN equation, as described in number two above, there are sample calculations which appear in italics.

Step 1

Unit Conversions

It is necessary to convert the units of some of the input data. PACMAN automatically converts all temperature into degrees Kelvin, all pressure to mmHg and all compositions into pounds.

Temperature: input either °C, °F or °K

$$T\ (°K) = t\ (°C) + 273.15 \quad (1.1)$$

$$T\ (°K) = (t\ (°F) - 32)\ 5/9 + 273.15 \quad (1.2)$$

Pressure: input either mmHg, in H_2O, PSIA, PSIG or kPa

$$P(mmHg) = P(in\ H_2O) * 1.868\ (mmHg/in\ H_2O) \quad (1.3)$$

$$P(mmHg) = P(PSIA) * 51.718\ (mmHg/PSIA) \quad (1.4)$$

$$P(mmHg) = (\ P(PSIG) + 14.7) * 51.718\ (mmHg/PSIA) \quad (1.5)$$

$$P(mmHg) = P(kPa) * 7.4983\ (mmHg/kPa) \quad (1.6)$$

Mass of components (M_i) in vessel prior to charge step (liquid phase) and mass of components (M_i) being charged: input either LB, Kg, or liters

$$M_i\ (LB) = M_i\ (Kg) * 2.2046\ (LB/Kg) \quad (1.7)$$

$$M_i\ (LB) = V_{Li}\ (l) * \rho_i\ (LB/ft^3) / 28.31685\ l/ft^3 \quad (1.8)$$

Mole Fraction Calculation

Moles (L_i) of components in vessel prior to charge step (liquid phase):

$$L_i\ (LB\text{-}Mole) = M_i\ (LB) / MW_i\ (LB/LB\text{-}Mole) \quad (1.11)$$

Nexisting<vo> = Me<vo> / mw<vo> (1.11.1)

Nexisting<ACE> = 3300 LB / 58.08 LB/LB-Mole

= 56.81818182 LB-Mole

Nexisting<ACN> = 3300 LB / 41.05 LB/LB-Mole

= 80.38976857 LB-Mole

Nexisting< Other > = 200 LB / 200 LB/LB-Mole

= 1.0000 LB-Mole

Moles (L_i) of components being charged:

L_i (LB-Mole) = M_i (LB) / MW_i (LB/LB-Mole) (1.11)

Ninput<vo> = Mi<vo> / mw<vo> (1.11.2)

Ninput<ACE> = 3420.3 LB / 58.08 LB/LB-Mole

= 58.88946281 LB-Mole

Ninput<TOL> = 3420.3 LB / 92.13 LB/LB-Mole

= 37.12471508 LB-Mole

Total moles (L_{total}) of combined stream:

L_{total} (LB-Mole) = ΣL_i (1.12)

Ltotal,charge = SUM(Nexisting<vo>) + SUM(Ninput<vo>) (1.12.2)

SUM(Nexisting<ACE, ACN, Other>) = 56.81818182 LB-Mole + 80.38976857 LB-Mole + 1.0000 LB-Mole

= 138.2079504 LB-Mole

SUM(Ninput<ACE, TOL>) = 58.88946281 LB-Mole + 37.12471508 LB-Mole

= 96.01417789 LB-Mole

Ltotal,charge = 138.2079504 LB-Mole + 96.01417789 LB-Mole

= 234.2221283 LB-Mole

Mole fractions (x_i) of combined stream:

$x_i = L_i$ (LB-Mole) / L_{total} (LB-Mole) (1.13)

Xcharge<vo> = (Nexisting<vo> + Ninput<vo>) / Ltotal,charge (1.13.2)

Xcharge<ACE> = (56.81818182 LB-Mole + 58.88946281 LB-Mole) / 234.2221283 LB-Mole
= 115.7076446 LB-Mole / 234.2221283 LB-Mole

= 0.494008168

Xcharge<ACN> = 80.38976857 LB-Mole / 234.2221283 LB-Mole

= 0.343220212

Xcharge<TOL> = 37.12471508 LB-Mole / 234.2221283 LB-Mole

= 0.158502167

Xcharge<Other> = 1.0000 LB-Mole / 234.2221283 LB-Mole

= 0.004269

Vapor Pressure Calculations

Vapor pressure, $p_i°$, of each volatile component can be calculated using the Antoine equation. The Antoine equation has the general form:

$\ln (p_i°(\text{mmHg})) = [\, a - (b/(T(°K) + c)) \,]$ (1.14)

The program calculates the vapor pressure of each volatile component using the Antoine equation in the form:

$p_i°\ (\text{mmHg}) = \exp [\, a - (b/(T(°K) + c)) \,]$ (1.15)

Pvapor,1<vm> = exp (a<vm> - (b<vm> / (Tsystem + c<vm>))) (1.15.1)

$T(^oK) = T(^oC) + 273.15$
$= 21^0C + 273.15$

$= 294.15\ ^0K$

Pvapor,1<ACE> = exp (16.82 - (2993 / (294.15 ^{0}K + (-35.63)))
= exp (5.242559183)

= 189.1535621 mmHg

Pvapor,1<ACN> = exp (16.16 - (2962 / (294.15 ^{0}K + (-44.24)))
= exp (4.307733184)

= 74.27193716 mmHg

Pvapor,1<TOL> = exp (16.28 - (3251 / (294.15 ^{0}K + (-46.61)))
= exp (3.146769007)

= 23.2607876 mmHg

Equilibrium Concentrations

For a system of ideal liquids and vapors at a given temperature, Raoult's Law gives a relationship to calculate the relative vapor and liquid equilibrium mole fractions.

Raoult's Law states that the partial pressure of a component, P_i, can be calculated by multiplying the components vapor pressure, $p_i°$, by the liquid mole fraction, x_i, which is equal to the total pressure, P_{total}, multiplied by the vapor mole fraction, y_i, or:

$$P_i = p_i° * x_i = P_{total} * y_i \qquad (1.16)$$

PACMAN also includes individual Activity Coefficients for each volatile component, and an Inert Saturation Factor that is applied to the partial pressure calculation. These values are pre-set to 1 and can be changed if information is available.

Ppartial,charge<v> = Pvapor,1<v> * Xcharge<v> * ac<v> * Inert Saturation Factor (1.16.3)

*Ppartial,charge<ACE> = 189.1535621 mmHg * 0.494008168 * 1.0 * 1.0*

= 93.44340468 mmHg

*Ppartial,charge<ACN> = 74.27193716 mmHg * 0.343220212 * 1.0 * 1.0*

= 25.49163002 mmHg

*Ppartial,charge<TOL> = 23.2607876 mmHg * 0.158502167 * 1.0 * 1.0*

= 3.686885241 mmHg

The vapor mole fraction, y_i, can then be determined for each component:

$$y_i = p_i°* x_i / P_{total} \qquad (1.17)$$

The total partial pressure for the system is the sum of the partial pressures for all volatile components:

Ppartial, charge, sum = SUM (Ppartial, charge<v>) + SUM (Ppartial,1<m>) (1.17.2)

SUM (Ppartial, charge<ACE, ACN, TOL>) = 93.44340468 mmHg + 25.49163002 mmHg + 3.686885241 mmHg

= 122.6219199 mmHg

SUM (Ppartial,1<m>) = 0.0 mmHg (No immiscible components in this example)

Ppartial, charge, sum = 122.6219199 mmHg + 0.0 mmHg

= 122.6219199 mmHg

The volatile and inert vapor partial pressures are related by:

$$P_{total} = \{\text{Sum of } P_i\} + P_{inert} \qquad (1.18)$$

The partial pressure of the inert component is calculated by:

$$P_{inert} = P_{total} - \{\text{Sum of } P_i\} \qquad (1.19)$$

Pinert,charge = Psystem - Ppartial,charge,sum (1.19.2)

Pinert,charge = 760 mmHg - 122.6219199 mmHg

= 637.3780801 mmHg

Step 2.

In Step 2 the mass of inert vapors being displaced from the vessel is calculated.

It is assumed that the charged stream displaces an equal volume of vapor from the vessel. The vapor displaced from the vessel is assumed to be in equilibrium with the total composition of the vessel. The total volume displaced is assumed to be equal to the sum of the volume of all the components in the charge stream.

$$V_L^{total} = \{\text{Sum of } V_i\} \qquad (2.1)$$

Vapor,charge = SUM(Volume,input<vom>) (2.1.1)

Vapor,charge = SUM(Volume,input<ACE, TOL>)

Vapor,charge = $69.17444508\ ft^3 + 63.26346478\ ft^3$

$= 132.4379099\ ft^3$

where: $V_i = M_i\,(LB) / \rho_i\,(LB/ft^3)$ (2.2)

Volume,input<vom> = (Mi<vom> / density<vom>) (2.2.1)

Volume,input<ACE> = $3420.3\ LB / 49.44456\ LB/ft^3$

$= 69.17444508\ ft^3$

Volume,input<TOL> = $3420.3\ LB / 54.06438\ LB/ft^3$

$= 63.26346478\ ft^3$

Charge rate can be calculated as:

$$v\,(ft^3/min) = V_L^{total}\,(ft^3) / \tau\ \text{(minutes)} \qquad (2.3)$$

Now, applying Dalton's Law to the volatile and inert components, the moles of each component in the displaced volume of vapor can be calculated:

$$P_i * V = N_i * R * T \tag{2.4}$$

or: $$N_i = P_i * V / (R * T) \tag{2.5}$$

For the inert:

$$N_{inert} = P_{inert} * V / (R * T) \tag{2.6}$$

Ninert,charge = (Pinert,charge * Vapor,charge) / (999 * Tsystem) (2.6.1)

*Ninert,charge = (637.3780801 mmHg * 132.4379099 ft^3) / (999 mmHg ft^3 /LB-Mole ^{0}K * 294.15 ^{0}K)*

= 0.287259963 LB-Mole

To calculate the overall mass of inerts, M_{inert}, leaving the vessel, the moles of inert, N_{inert}, is multiplied by its molecular weight:

$$M_{inert} = N_{inert} * MW_{inert} \tag{2.29}$$

Mcharge<i> = Ninert,charge * mw<i> (2.29.1)

*Mcharge<Inert> = 0.287259963 LB-Mole * 28.01LB/LB-Mole*

= 8.046151564 LB

For an open system:

$$n_i = P_i * v / (R * T) \tag{2.30}$$

The molar displacement rate, n_{inert}, of inerts can be calculated:

$$n_{inert} \text{ (Lb-Moles/Hr)} = P_{inert} * (v /(ft^3/min)) / (R * T) \text{ (60 min/ HR)} \tag{2.31}$$

And the overall mass rate of inerts, m_{inert}, can be calculated from the molecular weight:

$$m_{inert} \text{ (LB/HR)} = n_{inert} \text{ (LB-Moles / HR)} * MW_{inert} \text{ (LB/ LBMole)} \tag{2.32}$$

Step 3.

In Step 3, the mass of volatile components leaving are calculated.

It is assumed that the vapor leaving the vessel has the equilibrium composition calculated in Step 1.

As volatile compounds leave the vessel in the vapor phase, liquid volatile compounds are vaporized, thus maintaining equilibrium in the vent stream.

Dalton's Law can again be applied to calculate the moles of volatile components, N_i, leaving the vessel. For an ideal closed system:

$$P_i * V = N_i * R * T \quad (2.4)$$

or: $$N_i = P_i * V / (R * T) \quad (2.5)$$

Ncharge<v> = (Ppartial,charge<v> * Vapor,charge) / (999 * Tsystem) (2.5.1)

*Ncharge<ACE> = (93.44340468 mmHg * 132.4379099 ft^3) / (999 mmHg ft^3/LB-Mole ^{0}K * 294.15 ^{0}K)*
= 0.042114013 LB-Mole

*Ncharge<ACN> = (25.49163002 mmHg * 132.4379099 ft^3) / (999 mmHg ft^3/LB-Mole ^{0}K * 294.15 ^{0}K)*
= 0.011488824 LB-Mole

*Ncharge<TOL> = (3.686885241 mmHg * 132.4379099 ft^3) / (999 mmHg ft^3/LB-Mole ^{0}K * 294.15 ^{0}K)*
= 0.001661643 LB-Mole

To calculate the total mass of volatiles, M_i, leaving the vessel, the molecular weight is used:

$$M_i = N_i * MW_i \quad (3.5)$$

Mcharge<v> = Ncharge<v> * mw<v> (3.5.3)

*Mcharge<ACE> = 0.042114013 LB-Mole * 58.08 LB/LB-Mole*

= 2.445981875 LB

*Mcharge<ACN> =0.011488824 LB-Mole * 41.05 LB/LB-Mole*

= 0.471616225 LB

*Mcharge<TOL> =0.001661643 LB-Mole * 92.13 LB/LB-Mole*

= 0.153087169 LB

The rate is determined by dividing the reported output value by the step time, giving the rate in pounds per hour:

$$m_i = M_i / \tau\ (\text{min}) * (60\ \text{min/ HR}) \quad (3.6)$$

Particulate Matter from Tk-265 Sample Calculations

Urea Tank: TK - 265
Urea Prill Unloading Operations
Particulate Matter Emissions Calculations
Storage/Miscellaneous Tanks Equipment Set

Urea prills are pneumatically unloaded from tank trucks into TK-265. Some urea prill fines are carried over with the exhaust air and emitted in the tank vent. **The scrubber is part of the unloading process.**

Basis of Calculations:

50,000	lb. maximum tank truck load
1.5	hr minimum unload time
0.175	inch prill diameter
9.90	lb/ton weight basis as fines carryover to scrubber/filter
97.00%	% removal efficiency across scrubber
99.00%	% removal efficiency across filter
99.970%	% removal efficiency across scrubber and filter
8760	hrs/yr for potential emissions calculations
6	Potential unloads per day (Maximum number)
2	estimated trucks per day for actual emissions calculations
85.7%	% uptime used in actual emissions calculations
37,846,869	Estimated usage lb of urea/yr

Calculations:

Process material throughput	=	lb max truck load / hr minimum unload time	
	=	33333	lb/hr
		16.67	tons/hr
Emissions to Scrubber	=	lb PM emissions / ton * ton / hr	
	=	165.0	lb/hr
Emissions to Filter	=	lb/hr Emissions to Scrubber * (1- % removal efficiency across scrubber)	
	=	4.950	lb/hr after scrubber
Emissions to Atm	=	lb/hr emissions to Filter * (1- % removal efficiency across filter)	
	=	0.050	lb/hr after scrubber and filter
Potential emissions	=	(Estimated usage lb of urea / yr / 2000 lb/ton) * lb PM emissions / ton * (1- % removal efficiency across scrubber)	
	=	16261	lbs per year
		8.13	tons per year
Estimated Actual emissions	=	56.20	lbs per year
		0.028	tons per year

Allowable emissions per Process Weight Rule 326 IAC 6-3:

Allowable= 27.00 lb/hr

Note: Controlled emissions are less than the allowable.

VOC Vacuum Dryer Sample Calculations

Given: kg dry crystals (product), P;
fraction Loss on Drying (LOD) for each step, l
kg solvent rinse, R
wt fraction of solvent components, a, b,;
fraction filtrate that evaporates, e (assumed 10% based on process knowledge)
fraction LOD in initial liquid, i;
fraction LOD in final liquid, f;

Calculated: Total kgs in vessel, T;
kgs liquid in vessel, L;
fraction VOC in liquid; v;
kgs solvent A in Tank, At;
kgs solvent B in Tank, Bt;
kgs solvent A emitted, Ae;
kgs solvent B emitted, Be;

Equations:

$$T = P / (1.0 - l)$$

$$L = T - P$$

$$v = 1.0 - (L / (L + R))$$

$$At = v * L * a$$

$$Bt = v * L * b$$

$$Ae = (At_2 - At_1) * e$$

$$Be = (Bt_2 - Be_1) * e$$

For Example,

Filtration/Drying Emissions

	kgs dry crystals	LOD	Total kgs in "tank"	kgs liquid	% VOC	% A in liquid	kgs A in "tank"	% B	kgs B in "tank"	% filtrate that evaporates	kg A emitted	kg B emitted	Total VOC Emitted
After water washes:	*2.00*	*60.0%*	5.00	3.00	0.0%	0.0%	0.00	0.0%	0.000	0%			
After 1st solvent wash:	*2.00*	*60.0%*	5.00	3.00	76.9%	73.1%	2.19	3.8%	0.115	0%			
After 1st N2 blow:	*2.00*	*40.0%*	3.33	1.33	76.9%	73.1%	0.97	3.8%	0.051	10%	0.12	0.01	0.13
fter 2nd solvent wash:	*2.00*	*60.0%*	5.00	3.00	94.7%	89.9%	2.70	4.7%	0.142	0%			
After 2nd N2 blow:	*2.00*	*40.0%*	3.33	1.33	94.7%	89.9%	1.20	4.7%	0.063	10%	0.15	0.01	0.16
After 3rd solvent wash:	*2.00*	*60.0%*	5.00	3.00	98.8%	93.8%	2.81	4.9%	0.148	0%			
After 3rd N2 blow:	*2.00*	*40.0%*	3.33	1.33	98.8%	93.8%	1.25	4.9%	0.066	10%	0.16	0.01	0.16
Final product:	*2.00*	*7.0%*	2.15	0.15	75.0%	71.3%	0.11	3.8%	0.006	10%	0.11	0.01	0.12
kg solvent per charge =		10.00								kgs/lot	0.54	0.03	0.57
										lbs/lot	1.19	0.06	1.26
										lots/yr	210	210	211
										tons/yr	0.13	0.01	0.13

ELI LILLY AND COMPANY

PACMAN PROGRAM THEORY AND SAMPLE CALCULATIONS
FUGITIVE EMISSIONS - CASE 1

PROGRAM BACKGROUND

The fugitive emission program calculates the quantity of VOCs emitted from pump and agitator seals, connectors, liquid valve seals, vapor valve seals, and pressure relief valves. Fugitive emissions for process streams carrying hydrocarbon vapors and liquids are estimated by the use of emission factors, Lbs./Hr./Component. The emission rate of each VOC is determined by multiplying the emission factor by the number of components, and mass fraction of VOC within the component.

The program allows for the choice of emission factors. Four choices are available which are: 1) EPA SOCMI factors, 2) SOCMI/HON factors that include LDAR, 3) LeakDAS factors and 4)Ad hoc factors. The LeakDAS factors are not available from PACMAN at this time. The ad hoc factors enables the user to evaluate the emission rates using other factors.

Comparison of the emission factors are tabulated below:

EMISSION FACTORS LB/HR/COMPONENT

METHOD	PUMPS & AGITATORS	CONNECTORS	LIQUID VALVES	GAS VALVES	PRESSURE RELIEF VALVES
1	0.108908	0.001830	0.015653	0.012346	0.229281
2	0.004969	0.000697	0.001459	0.000309	0.229281
3					0.229281

Note: LeakDAS factors will be supplied by the LeakDAS program (at a later date and the Ad hoc factors are user generated.

PROGRAM STRUCTURE

The information necessary to run the program is:

Time in service per batch (Hrs. or Min.) - This is the time the component is in contact with the VOC.
10 Hours

Weight fraction of VOCs
Ethanol - 0.25
Methanol - 0.25
Methylene Chloride - 0.3

Number of components, ie; pumps/agitators, connectors, liquid valves, vapor valves, and pressure relief devices.
Pumps - 2
Agitators - 2
Connectors - 25
Liquid valves - 10
Gas valves - 5
Pressure relief valves - 2

Emission Factors
F*rom table above (EPA SOCMI Factors)*

Total hours per reporting period (needed to run Process Emission Summary Report, will be recorded in step note)
60 Hours

Number of batches per reporting period (needed to run Process Emission Summary Report, will be recorded in step note)
5 Batches

Building or equipment to which the fugitive emissions are attributed.
C66

The program calculations are broken down into four steps:

Step 1 - The Emission Rate (lbs. / hr.) - For each component type is calculated.

Step 2 - The Total Emission Rate (lbs. / hr.) - Sum of the emission rates from each components is calculated.

Step 3 - The Total Emissions (lbs.) - The total emission are calculated from the total emission rate and the step time.

Step 4 - The Emissions for Each Compound (lbs.) - Emissions based on weight fraction is calculated.

PROGRAM THEORY AND CALCULATIONS

This section explains the calculation methods for each step in the fugitive emission program.

The program allows for the choice of four sets of emission factors for the various components. If method 1 is chosen, the EPA supplied SOCMI numbers are used for the emission factors. If method 2 is chosen, the Lilly standard LDAR factors are used. If method 3 is chosen, the user supplies the factors for all the components except for pressure relief valves. Method 4 is currently unavailable, LeakDAS will supply these factors. The pressure relief valve factor can not be changed and is constant for all three methods.

<u>Step 1</u>

Emission Rate

The emission rate for each component is the total emissions for each component type, valve, connector, etc.

Emission Rate [lbs. / hr.] = Component Count * Emission Factor [(lbs. / hr.) / component] (1.0)

Note: for the purpose of this hand calculation the EPA SOCMI emission factors have been used.

*Emission Rate lbs. / hr. (Pumps) = 2 * 0.108908 lbs. / hr. / component*

= 0.217816 lbs. / hr.

*Emission Rate lbs. / hr. (Agitators) = 2 * 0.108908 lbs. / hr. / component*

= 0.217816 lbs. / hr.

*Emission Rate lbs. / hr. (Connectors) = 25 * 0.001830 lbs. / hr. / component*

= 0.04575 lbs. / hr.

*Emission Rate lbs. / hr. (Liquid Valves) = 10 * 0.015653 lbs. / hr. / component*

= 0.15653 lbs. / hr.

*Emission Rate lbs. / hr. (Gas Valves) = 5 * 0.012346 lbs. / hr. / component*

= 0.06173 lbs. / hr.

*Emission Rate lbs. / hr. (Press. Relief Valves) = 2 * 0.229281 lbs. / hr. / component*

= 0.458562 lbs. / hr.

<u>Step 2</u>

Total Emission Rate

The total emission rate is the sum of the individual emission rates for each component type during the step.

Total Emission Rate [lbs. / hr.] = S Emission Rate [lbs. / hr.] (for each component type) (2.0)

Total Emission Rate lbs. / hr. = 0.217816 lbs. / hr. + 0.217816 lbs. / hr. + 0.04575 lbs. / hr. + 0.15653 lbs. / hr. + 0.06173 lbs. / hr. + 0.458562 lbs. / hr.

= 1.158204 lbs. / hr.

Step 3

Total Emissions

The total emissions are the total of all the emissions from all the component types based on the step time.

Total Emissions [lbs.] = Total Emission Rate [lbs. / hr.] * Time in service per batch [hr.] (3.0)

*Total Emissions [lbs.] = 1.158204 lbs. / hr. * 10 hrs.*

= 11.58204

If the step time is entered in minutes a factor of 1 hr. / 60 min. will be used to obtain hours.

Step 4

Emission Quantity (by Compound)

The emissions for each compound is the total emissions multiplied by the mass fraction for that compound.

Emission Quantity $_i$ (by Compound) [lbs.] = Total Emissions [lbs.] * Mass Fraction $_i$ (4.0)

*Emission Quantity (Ethanol) lbs. = 11.58204 lbs. * 0.25*

= 2.89551 lbs.

*Emission Quantity (Methanol) lbs. = 11.58204 lbs. * 0.25*

= 2.89551 lbs.

*Emission Quantity (Methylene Chloride) lbs. = 11.58204 lbs. * 0.3*

= 3.474612 lbs.

The total hours per reporting period and the number of batches per reporting period are used to generate the Process Emission Summary Report in PACMAN. This report which, based on the number of lots and the total time in the reporting period, will list the emissions by material and material class in pounds and the average rate in pounds per hour.

Particulate Matter from Tk-265 Sample Calculations

Urea Tank: TK - 265
Urea Prill Unloading Operations
Particulate Matter Emissions Calculations
Storage/Miscellaneous Tanks Equipment Set

Urea prills are pneumatically unloaded from tank trucks into TK-265. Some urea prill fines are carried over with the exhaust air and emitted in the tank vent. **The scrubber is part of the unloading process.**

Basis of Calculations:

50,000	lb. maximum tank truck load
1.5	hr minimum unload time
0.175	inch prill diameter
9.90	lb/ton weight basis as fines carryover to scrubber/filter
97.00%	% removal efficiency across scrubber
99.00%	% removal efficiency across filter
99.970%	% removal efficiency across scrubber and filter
8760	hrs/yr for potential emissions calculations
6	Potential unloads per day (Maximum number)
2	estimated trucks per day for actual emissions calculations
85.7%	% uptime used in actual emissions calculations
37,846,869	Estimated usage lb of urea/yr

Calculations:

Process material throughput	=	lb max truck load / hr minimum unload time	
	=	33333	lb/hr
		16.67	tons/hr
Emissions to Scrubber	=	lb PM emissions / ton * ton / hr	
	=	165.0	lb/hr
Emissions to Filter	=	lb/hr Emissions to Scrubber * (1- % removal efficiency across scrubber)	
	=	4.950	lb/hr after scrubber
Emissions to Atm	=	lb/hr emissions to Filter * (1- % removal efficiency across filter)	
	=	0.050	lb/hr after scrubber and filter
Potential emissions	=	(Estimated usage lb of urea / yr / 2000 lb/ton) * lb PM emissions / ton * (1- % removal efficiency across scrubber)	
	=	16261	lbs per year
		8.13	tons per year
Estimated Actual emissions	=	56.20	lbs per year
		0.028	tons per year

Allowable emissions per Process Weight Rule 326 IAC 6-3:

Allowable= 27.00 lb/hr

Note: Controlled emissions are less than the allowable.